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TRAINING MANAGEMENT INFORMATION SYSTEM OF THE DEFENSE INSTITUTE OF SECURITYASSISTANCE MANAGEMENT: USER SATISFACTION AS A MEASURE OF ITS EFFECTIVENESS

THESIS

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THESIS

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Degree of Master of Science in Logistics Management

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Paulo R. O. Ruy

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Abstract

The purpose of this study was to evaluate the effectiveness of the Training Management System (TMS) installed in the Security Assistance Organizations around the world. User satisfaction was measured as an indicator of the system's effectiveness.

In order to provide an objective measurement of the system effectiveness, the following research questions were addressed: (1) What is the system effectiveness regarding the level of product quality provided by TMS ? (2) What is the level of involvement and knowledge of TMS user related to the information services function? (3) What is the level of user perceived satisfaction with the staff and services provided by support people of TMS ? (4) What is the perceived difference in levels of satisfaction between military and civilian for each of the questions 1, 2 and 3 above? (5) What is the impact of experience with the system on questions 1 to 3 above?

User satisfaction was determined to be the best possible measure of system effectiveness and it was measured by administering a user satisfaction survey. The data gathered from this survey was analyzed and that analysis provided the basis for concluding that TMS was meeting the users' needs, but that the system effectiveness could be improved by providing training. Recommendations were offered to the TMS staff support and suggestions for further research were also given.

MANAGEMENT INFORMATION SYSTEM OF THE DEFENSE INSTITUTE OF SECURITY ASSISTANCE MANAGEMENT: USER SATISFACTION AS A MEASURE OF ITS EFFECTIVENESS

I. Introduction

Background

The overseas Security Assistance Organization (SAO) is the U. S. Government office, normally located in the American Embassy, that is responsible for the overseas management of the U. S. security assistance program. Security assistance is a group of programs authorized by the Foreign Assistance Act of 1961 and the Arms Export Control Act (as amended) by which the United States provides defense articles or services (including military training) to other countries. In the case of the international military training program, the SAO is totally responsible for the identification of all host-country training requirements, the requesting of that training from U. S. military services, and the execution and implementation of the training.

The Security Assistance Network (SAN) is a particular type of Information System that contains among various items a database used in the management of the international military training program. This database is called Training Management System (TMS) which intended use is to provide the training program manager in the overseas Security Assistance Office (SAO) information related to the training program. In this research TMS will be evaluated regarding its effectiveness as measured under the view of user satisfaction.

The development of such an information system involves the spending of economical and human resources which are becoming more and more scarce. Therefore it is important to know if this investment is providing the expected return to the Department of Defense (DoD). One indirect way to know if this return is adequate is by measuring its degree of effectiveness.

Problem Statement

The training management system (TMS) provides a modern database management system that allows the SAO to effectively manage its training program which includes generating training requests, tracking, programmed and scheduled training, recording all required informational data on the student trainees, producing required Defense Department documentation on the students, and entering the students into training in the U. S. Prior to the advent of the TMS system, this was accomplished via a computer print out (three different versions from the three different military services) mailed worldwide once a month with delivery times of up to a month.

However, the problem that arises is related to the fact that regardless of how well the system is operating technically or improved its features, its level of effectiveness may or may not be favorably when viewed by the user.

Therefore, the problem is to measure the system effectiveness as a dependent variable of user satisfaction, information quality, and system quality. Also it is necessary to compare different versions of the system, and provide data to decision makers of the

TMS staff. This will enable them to better understand the view of the user, and as a result, help them to improve the product and quality of system support in specific areas.

In other words, the purpose of this work is to measure the degree of TMS success in order to provide data to the system's manager and make him able to improve the quality of services and products offered by TMS. This practice will make the manager able to implement changes based on the perceptions of the user by listening to his/her voice and make the necessary decisions.

Research Questions

In order to provide an objective measurement of system effectiveness for the Training Management System, the following research questions must be answered.

1. What is the system effectiveness regarding to the level of product quality provided by TMS ?
2. What is the level of involvement and knowledge of TMS' user related to the information services function?
3. What is the level of user perceived satisfaction with the staff and services provided by support people of TMS ?
4. What is the perceived difference in levels of satisfaction between military and civilian for each of the questions 1,2 and 3 above?
5. What is the impact of experience with the system on questions 1 to 3 above?

Methodology

The methodology adopted in this research is a survey of user information satisfaction based in a validated self-administered questionnaire. This questionnaire was sent by e-mail to many SAOs around the world in order to capture users opinion about TMS. The respondents sent back the answers by e-mail or by fax. After this, the raw data were processed in order to draw conclusions about TMS' effectiveness.

Scope

The results of this research are not generalizable to other types of information systems beyond the TMS. Even though the questionnaire is validated, and its reliability was replicated and evaluated by using the survey data, the applicability and the recommendations draw from the analysis concerning the system effectiveness are specific to TMS.

Also, the findings of this research will be analyzed focusing on detecting areas of the system that requires improvement in order to increase system effectiveness. It is out the scope of this research to indicate specific ways of how to achieve the goals of the recommended management actions.

Summary

The remaining chapters of this research are divided as follow. Chapter II has the objective to review the literature related to the topic of this research, beginning with a broad model of system effectiveness and narrowing it to the specific areas of research. Chapter III describes in depth the methodology adopted in this research, presenting the design of the sample frame, the method of data collection, and the evaluation of the

survey instrument respecting to its validity. Chapter IV analyses the results of this research presenting the processed raw data in form of tables. This chapter also, describes the statistical tests utilized and presents results of regression analysis. Finally, Chapter V addresses the conclusions based on the findings previously analyzed in Chapter IV and provides recommendations for management action as well as for future research.

II. Literature Review

Introduction

This chapter describes the concept of information system effectiveness from a perspective of total quality management and the importance of listening to the voice of the customer as a measure of system effectiveness. Also, this chapter provides a review of the validated survey instruments used to measure user satisfaction as an indicator of system effectiveness. Finally, a description of the system under investigation is provided concerning its functions, products and users.

Model for System Effectiveness

Much research has been done in the field of information system effectiveness. DeLone and McLean (1992) has organized this research into a comprehensive model of information system success. The model proposed presents information system effectiveness or success composed of six interrelated dimensions: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. The idea of interdependency among the six dimensions is showed in Figure 1.

The model of information system success is viewed as a process construct. In this process one should consider the idea of time as well as the causal relationship among the six categories. For example use and user satisfaction are both effected by system quality and information quality when considered singularly and jointly. Also, use and user satisfaction interact between themselves and both have influence over individual impact.

Finally, this latter dimension has some effect over organizational impact. Each of these dimensions are discussed below.

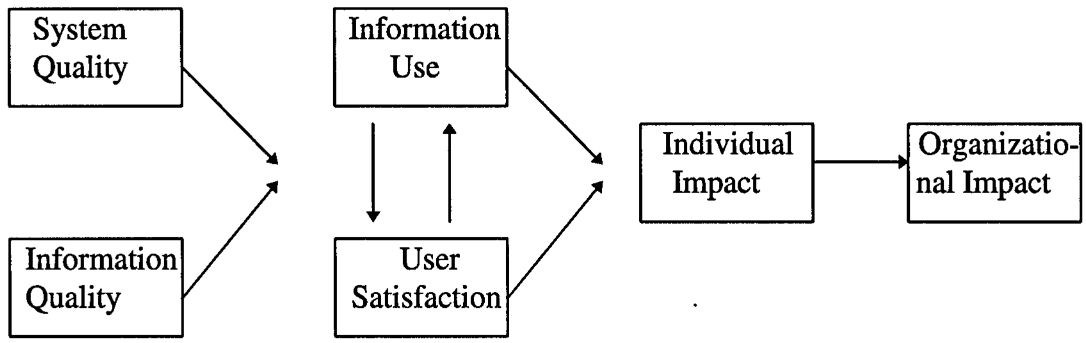

Figure 1. Information System Success Model (DeLone and McLean,1992).

System Quality. Total quality management (TQM) is a concept whose focus is on the customer. Regardless of whether the customer is internal or external to the company, his demands and satisfaction must be met. Therefore, the first element of organizational culture affected by TQM, is focus. There is no question that a firm customer focus brings competitive advantage. In addition, TQM takes the view that profits follow quality, not the other way around. Poor quality can be seen and will be rejected. Fail to satisfy a customer's quality demands even once, and the company might lose that customer possibly forever. As a result, profit cannot, in reality, be "maximized" if customers choose a competitor's product. If enough customers refuse to buy the company's offerings, then profit will be nonexistent.

Now, the issue is how can we bring the concept of customer satisfaction to the field of Information Systems (IS). In other words, what does TQM mean to IS

considering the aspect of customer satisfaction? Under TQM, it will not be enough to deliver defect-free systems according to user requirements. The IS professional has to look beyond the user to the user's customer to be sure the system is actually "doing the right thing." In other words, the true customer for the system has to be identified and his requirements considered (Ward, 1994). In doing that, a quality system is able to deliver defect-free output and to meet the expectations of all potential customers. The literature has presented many examples of signals emitted by the customers trying to communicate their complaints, in product output or services of IS (Palmer, 1991). Therefore, IS professionals need to consider the user involvement beginning with the early requirements phase, through design, implementation, and maintenance (Senn, 1980). The latter is as important as the early phase because the environment is dynamic and it is necessary to continually monitor system quality through customer satisfaction.

Wang and Kon (1997) developed a framework for Total Data Quality Management in which the concept of continuous measurement, analysis, and improvement is introduced. The first concept relates to the importance of a clear understanding of the multiple dimensions encompassing data quality, because the production of quality data can be limited without this understanding. Second, it is necessary to know how analysis of data quality impacts business, for example, by relating data quality to sales, customer satisfaction, and profitability. Finally, the concept of continuous improvement encompasses three dimensions: business redesign, in order to minimize the occurrence of data errors; motivation, which focuses on how rewards can

improve data quality; new technologies, which emphasizes aspects of improvement in techniques of data entry.

Considering measures of system quality there is one early work developed by Swanson (1974) who used several system quality items to measure MIS appreciation among user managers. His items included the reliability of computer system, on-line response time, the ease of terminal use, and so forth. Hamilton and Chervany (1981) also proposed data currency, response time, turnaround time, data accuracy, reliability, completeness, system flexibility, and ease of use as part of a framework to measure system quality.

In a more recent work, Pitt et al (1995) developed an instrument to measure service quality. The questionnaire consists of 22 scales each one ranging from 1 through 7, which presented in a factor analysis five components for the construct service quality: tangibles, which assesses physical facilities, equipment, and appearance of personnel; reliability, which is related to the ability to perform the promised service dependably and accurately; responsiveness, which means the willingness to help customers and provide prompt service; assurance, related to the knowledge and courtesy of employees and their ability to inspire trust and confidence; and empathy, which relates to caring, individualized attention the service provider gives its customers.

Among the several practical applications using empirical measures of system quality, there is one field study performed by Srinivasan (1985) in which he evaluated the computer-based modeling systems of 29 firms accessing their system quality by using a measure which included response time, system reliability, and system accessibility.

Information Quality. This dimension focuses on the quality of the information system output. In other words, it is related to the quality of the information that the system produces, primarily in the form of reports. For example, DeLone and McLean (1992) have emphasized the role of information quality and user satisfaction as two major dimensions for evaluating the success of information systems. These two dimensions generally include some data quality attributes, such as information accuracy, output timeliness, precision, reliability, currency, completeness, and relevancy (Ives, B. et al, 1983 and Bailey and Pearson, 1983). In this same line of research, Olson and Lucas (1982) proposed report appearance and accuracy as measures of information quality in office automation information systems. Also, under the broad area of "User Information Satisfaction" Iivari and Koskela (1987) developed a satisfaction measure including three information quality constructs: "informativeness" which consists of relevance, comprehensiveness, recentness, accuracy, and credibility; "accessibility" which consists of convenience, timeliness, and interpretability; and "adaptability".

In a more recent work, Wang and Strong (1996) developed a framework based on data collected from data consumers, considering the aspects of data quality that are more important to them. Their findings showed four data quality categories each one consisting of specific attributes. The first category consists of accuracy, objectivity, believability, and reputation and denotes that data have quality in their own right. The second consists of value-added, relevancy, timeliness, completeness, and appropriate amount of data and highlights the aspect that data quality must be considered within the context of the task at hand. The third one consists of interpretability, ease of

understanding, representational consistency, and concise representation. Finally, the fourth includes accessibility and access security with these latter two categories emphasizing the importance of the role of systems play in data quality issues.

Some researchers applied information quality measures in their field studies. For example, Miller and Doyle (1987) performed a field study in an overall I/S including 21 financial firms. They surveyed 276 user managers by using a measure that covered attributes of completeness of information, accuracy of information, relevancy of reports and timeliness of report. They found that the overall IS success is correlated with the relationship between perceived performance and importance. Another finding was that there is a mismatch between perceived importance and performance in developing more of the different basic systems types.

Information Use. System usage, the utilization of information technology (IT) by individuals, groups or organizations, is a core variable in IS research. This dimension focuses on the use of information system reports which is one frequently reported measures of the success of an information system. Under the conceptual view Ein-Dor and Segev (1978) claimed that different measures of computer success are mutually interdependent and so they chose system use as the primary criterion variable for their I/S research framework.

An objective approach to measure usage is computer-recorded data. It can be measured for example as the number of computer inquiries, percentage of customer records updated annually, connect time and frequency of computer sections, number of

information reports generated by the system and the frequency of user's access and connect time along with the number of light, average, and heavy users (Srinivasan, 1985).

In addition to conceptual studies, this measure has been used in field studies. For example, Adams et. al. (1992) used this measure in their studies of e-mail and voice-mail considering the number of messages as the system usage measure. Also, in their evaluation of WordPerfect and Harvard Graphics they used extent of use as their measure of system usage. The other dimension to be reviewed is the User Satisfaction, as popular as the Use dimension.

User Satisfaction. Ives et al (1983) define User Information Satisfaction as the extent to which users believe the information system available to them meets their information requirements. There has been much attention paid to the concept of user satisfaction as a measure of effectiveness of information systems and the productivity of the system users.

Determining the effectiveness of an organization's information services function is a crucial management concern. This determination may lead to the decision to restructure, or even out-source the information services function (ISF). Developing measures of effectiveness has been a focus of MIS research and the most commonly used measures of effectiveness within the MIS field are user's perceptions of satisfaction (Gatian, 1984). There has been significant research into determining user satisfaction. In general, two types of user satisfaction instruments have been developed: the End-User Computing Satisfaction (EUCS) and User Information Satisfaction (UIS).

End-User Computing Satisfaction. Instruments to measure End-User Computing Satisfaction were developed as a result of the increase in personal computing in the 1980s and 1990s. Doll and Torkzadeh (1988) to investigated the measurement of the user satisfaction construct in relation to the growing field of end-user computing (EUC). They created a 12-item instrument based on five components of user satisfaction: content, accuracy, format, ease of use, and timeliness. Etezadi-Amoli and Farhoomand (1996) have developed a measure of end user computing satisfaction (EUCS). The instrument was developed around six elements of EUCS including documentation, ease of use, functionality of system, quality of output, support, and security. The research supported the idea that user satisfaction was useful in determining the user performance (Etezadi-Amoli and Farhoomand, 1996). However, while their measure attempts to capture the satisfaction of end-users with respect to a specific information systems application, it does not include a direct assessment of end-user support services or, more generally, of the ISF. In order to gauge the products and services of a firm's information services function, a second user satisfaction instrument, User Information Satisfaction (UIS), has been frequently employed.

User Information Satisfaction. Early instruments measuring User Information primarily focused on the quality of information product attributes such as relevance, timeliness, accuracy, and format. Bailey and Pearson (1983) created one of the earliest tools for measuring computer user satisfaction, a 39 item user satisfaction survey. Ives et al (1983) and Baroudi and Orlikowski (1986) continued their work and in a replication study sought to shorten the instrument to include 22 and 13 items,

respectively, which they asserted still effectively measured the user acceptance construct and reinforced its validity.

The instrument developed by Bailey and Pearson (1983) broadened the user satisfaction measurement to focus on additional dimensions of ISF activities including training, documentation, and staff communication. This instrument has been the focus of a series of studies which identified its major dimensions as: (1) Quality of Information Products, which focuses on the product or technical quality of information systems delivered by the ISF; (2) Level of User's Knowledge and Involvement, which connotes the proactive posture of the users to participate with the information services function or in systems development; and, (3) Attitude towards Electronic Data Processing Staff and Services, which focuses on an assessment of perceived satisfaction with the staff and services of the ISF. Thus the evolved and empirically derived instrument attempts to evaluate both product and service dimensions of IS customer satisfaction. That is, it intends to assess not only what the ISF delivers, but also how and under what conditions this is done. Among the three dimensions of UIS, the Quality of Information Products dimension includes technical assessment of the content and presentation of product. The other two dimensions, especially the attitude towards EDP Staff and Services dimension, clearly capture the functional attributes about services and user relationships with ISF staff. The next sub-section will describe in more detail the survey instrument of Baroudi and Orlikowski (1986) in terms of its validation.

<u>Validation.</u> In this section the construct validity and convergent validity of the short –form Baroudi and Orlikowski's measure instrument are described.

Construct Validity. It is established by showing that "the measure is an appropriate operational definition of the construct it purports to be measuring" (Stone, 1978). Baroudi and Orlikowski (1988) replicated two methods used before by other researchers. The first, weaker method examines the correlation between each scale and the total UIS score. The results for this method presented the 13 correlations ranging from .35 to .69 with 11 correlating at levels greater than .50.

The second method uses factor analysis which allows an examination of the underlying structure of the measure. The results showed that the 13 questions were decomposed into three groups:

EDP Staff and Services. This factor is related to respondents' self-reported assessment of the attitude and responsiveness of the EDP staff as well as the quality of their relationship with the EDP staff. It includes the following scales as showed in the questionnaire of Appendix A:

Q1- Relationship with the DISAM TMS support staff;

Q2- Processing of requests for changes in TMS;

Q6- Attitude of the TMS support staff;

Q11-Communication with the TMS support staff;

Q12-Time required for TMS 4.0 development.

Information Product. This factor means the respondent judgment respect to the quality of output delivered by the information system. It includes the following scales:

Q7- Reliability of output information provided by TMS;

Q8- Relevancy of output information provided by TMS;

Q9- Accuracy of output information provided by TMS;

Q10- Precision of output information provided by TMS;

Q13- Completeness of output information provided by TMS.

Knowledge and Involvement. This factor is directly related to the quality of training provided to the respondents, their understanding of the system, and their participation in its development. It includes the scales:

Q2- Processing of requests for changes in TMS;

Q3- Degree of TMS training provided to users;

Q4- User's understanding of the TMS;

Q5- User's feelings of participation.

This replication performed by Baroudi and Orlikowski shows that all but one of the 13 scales loads as expected. The only exception is question 2 that loads on two factors: EDP staff and services, and knowledge and involvement. This is aceptable and lead the conclusion that "the factor structure of the questionnaire is stable and provides strong evidence for the construct validity of the measure." (Baroudi and Orlikowoski, 1988).

Convergent Validity. According to Stone, " the extent to which a measure is correlated or "agrees" with other measures of the same construct provides evidence for convergent validity" (Stone, 1978). In order to replicate this validity, Baroudi and Orlikowski performed interviews of user satisfaction within five organizations and formed two groups : satisfied and dissatisfied. Then they used a t-test to compare the mean score for each group and found that there was a significant difference between the two groups a $p< .001$. They concluded that these results "provide some evidence for the measure's convergent validity" (Baroudi and Orlikowski,1988).

Considering the multidimensional characteristic of the MIS success construct, the research performed by DeLone and McLean (1992), among other findings, found that the user satisfaction measure developed by Bailey and Pearson (1983), covers three dimensions of the six proposed in the model. In particular the Bailey and Pearson (1983) measure covers the dimensions of information quality, system quality, and user satisfaction. The instrument to be used in this research is the UIS considering its multidimensional characteristics of including service quality dimensions and relationships with ISF staff in addition to information quality.

Individual Impact. This dimension is about the effect of information on the behavior of the recipient. The impact or influence of information can be viewed for example in the decision context if the user has a better understanding of the decision, or if he/she has improved the productivity of the decision-making process, or has changed the decision maker's perception of the importance or usefulness of the information system. Also, decision effectiveness can be defined as the dependent success variable including

dimensions of the average time to make a decision, the confidence in the decision made, and the number of reports requested. Therefore one method of measuring I/S impact is to determine whether the output of the system causes the decision maker to change his or her behavior.

Organizational Impact. This dimension relates to the effect of information on organizational performance. This idea can be explained considering that the success of the MIS department is reflected in the extent to which the computer is applied to critical or major problem areas of the firm. For example one company can be ranked on the basis of the range and scope of its computer applications, or the firm's ability to computerize high complexity applications.

Considering the economics view a firm can be assessed by the cost reductions and company profits realized from specific user-developed application programs. Following this idea, the company revenues can also be improved by computer-based information systems. In this case it should be measured the relationship of corporate outcomes such as total sales and return on investment to I/S inputs.

With the corporate "bottom-line" in mind, it should be considered that MIS effectiveness be determined by its contribution to company profits, for example asking users of a particular I.S. what savings were realized from the use of that I.S. and what costs were incurred by using it. Therefore, one measure of organizational performance which might be appropriate in this context is return on investment. And in a broader sense one could measure the extent to which an office information system contributed to meeting organizational goals.

Given the significance of the information quality and the importance of the end-user role in determining that quality, this thesis will research system's effectiveness and its impact on user information satisfaction with the specific information system, the Training Management System. Therefore it is important to determine the degree to which the measurement of User Information Satisfaction (UIS) provides the TMS users a product that fulfills their expectation and requirements. This measurement will be useful in detecting areas in which that system needs improvement.

The Training Management System (TMS)

The security assistance network (SAN) is used by all levels of Security Assistance program management to communicate in the worldwide Security Assistance environment. Thus, the SAN is used by the overseas Security Assistance Organization (SAO) training offices, the Unified Command security assistance training offices, the Defense Security Assistance Agency (DSAA) training managers, the Military Department training managers, and the various military school international military student offices. Figure 1 provides a graphic portrayal of this network. Data for the various programs, including the international military training program, are provided via the SAN (SAN I, 1997).

The training program data consists of the Military Articles and Services List (MASL), which is a master price list of all U. S. training available to the foreign customer. It includes information such as the course title, duration, price, location, security classification, etc. The Standardized Training List (STL) is the actual training

that has been requested and approved for the country and includes both financial (cost information) and dates of the training. A third database is the Location Table data which simply provides information on the training location.

Training program data is uploaded by the military training management organizations (Army, Navy, and Air Force) to the SAN and where it is consolidated and made available via controlled access to the overseas training manager. This is portrayed in Figure 2.

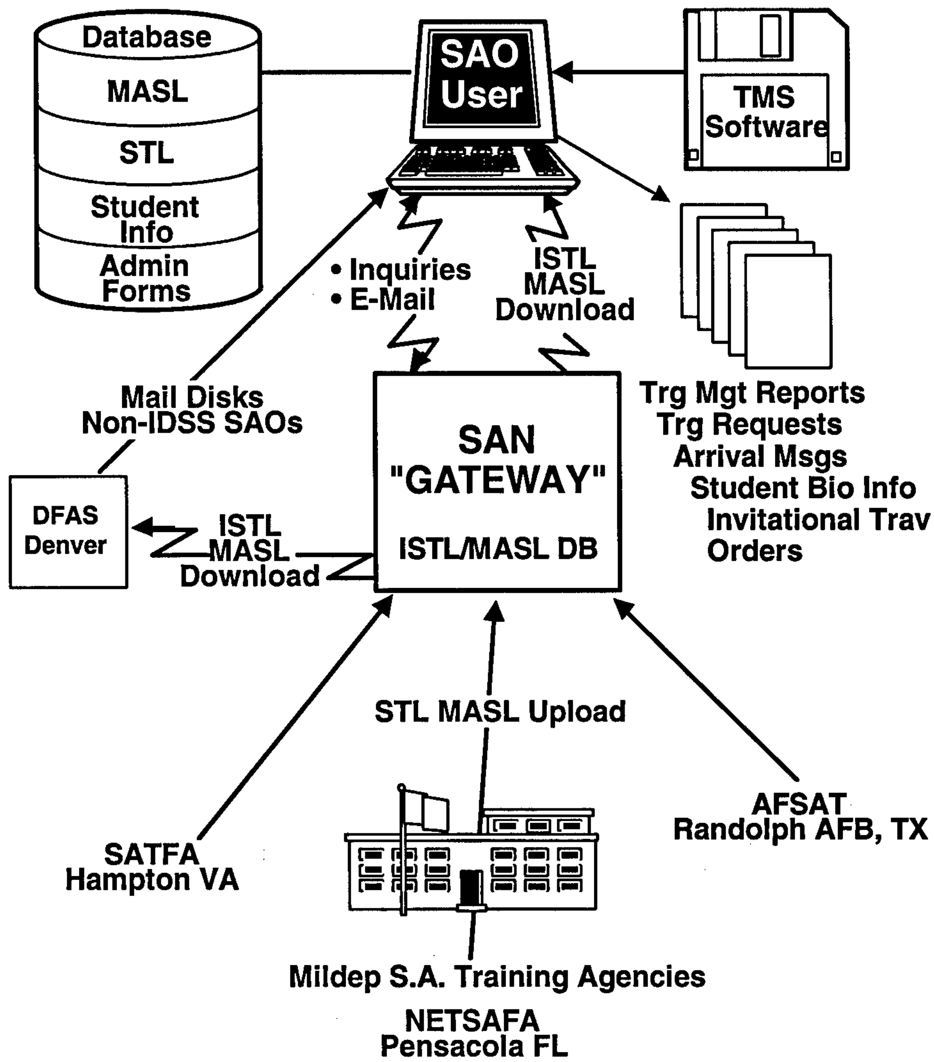

Figure 3. TMS Software in the SAN (DISAM, 1996).

The training management system (TMS) is a database management system that assists the primary user, the overseas Security Assistance training management office, in the management and execution of the internatioanal military training program. Program data is downloaded from the security assistance network, imported to the TMS system, and used to generate various management reports that facilitate program management.

TMS provides both detail and summary reports on the country's training program. The summary reports allow the SAO training manager to manage the country training program and keep it within the authorized State Department allocation level. The detail reports allow the SAO to keep track of all the training that has been requested and must be entered into the training program data by the military department training agencies in the United States. TMS generates reports that tell the SAO training manager when the next student is to be given an English Language test or when the student must depart for scheduled training in the U. S. TMS generates the DD Form 2285, the official Invitational Travel Order which is a legal document that is required for the student to enter training.

The system provides a means to generate training request messages to the military departments that result in required changes to the training program. TMS extracts data from the various military department provided databases such as the MASL, STL, and Location Table databases, combines this with the SAO generated student information database, and then produces the official invitational travel order (ITO) required by regulation for all international military students to enter US training(DISAM, 1996).

Fielding of the TMS software was begun in 1991-92 with the first versions, TMS 1.0, TMS 2.0, etc. The first fully operational version of the software was fielded as TMS 3.1 in early 1994. It was developed by a civilian contractor using *FoxPro* and could only be changed by having the contractor accomplish program changes. That version has proven to be quite reliable and continues to be used by many SAOs(SAN II,1996). TMS Version 4.0, programmed using ***MS Access*** by US government personnel, was first

fielded worldwide in the spring of 1996. Fielding of TMS 4.1 was being accomplished as work on this analysis progressed. A final edition of TMS 4.1 will be fielded in about June/July 1997 after all problems identified with TMS 4.0 have been solved. For these reasons the version to be surveyed is the 4.0 and not 4.1 (SAN II, 1996).

The greatest differences between the various versions of the TMS software are found between the TMS 3.1 and 4.X versions. TMS 3.1 was "hard coded" using Fox Pro and was a simple, straight forward DOS based system. TMS 4.0, a MS Access application, was much more sophisticated and provide for greater capability for the user. For example one capability of TMS 3.1 that was never duplicated in TMS 4.X was a "custom report" function that allowed the user to formulate his own unique reports on the various databases. TMS 4.X attempted to provide a very wide range of canned reports that would meet all user needs. However, as it was the first version of the 4.X series, it definitely had more "bugs" in it. TMS 4.0 was not released as a test or "beta" version, but rather as a final release. Complete, final testing had not effectively been accomplished. TMS 4.1 corrected the various problems and added features that had been requested by users.

The Defense Institute of Security Assistance Management (DISAM) is responsible for all aspects of system development, fielding, user training, and system support (Collins, 1997).

III. Methodology

Introduction

The most common way pointed by the literature to monitor the voice of the customer is through surveys of user information satisfaction (UIS) (Scott, 1988). Using these surveys as a gauge, it will be possible to measure the effectiveness of a system and consequently its "successes" (Newcomer, 1991). Besides measuring effectiveness it is necessary to know if we are addressing the issues most important to the customer to provide a complete picture of user satisfaction (Richardson, 1994). Much research has been done in this field to incorporate attributes of quality into products of IS. These attributes, accuracy, consistency, conformity, precision, timeliness and usability, were measured using validated and reliable tools (Mallach, 1988). As a result, many problems related to usefulness and usableness of MIS reports can be minimized (Rand, 1984). In order to obtain the data necessary for analysis, this research will rely upon a survey of user satisfaction considering the reasons mentioned above. It will make use of an available and already validated self-administered questionnaire (Baroudi and Orlikowski, 1988) that will be sent to a sample of users in many SAOs around the world in order to capture their opinions.

The researchers validated the questionnaire using a sample of 358 employees representing a wide variety of industries including banking, insurance, retailing, and manufacturing, with an average of 12 employees from each company.

In order to evaluate the construct validity the researchers used factor analysis method which showed that the 13 questions were decomposed into three groups:

electronic data processing (EDP) staff and services, information product, knowledge and involvement. The researchers evaluated the convergent validity by performing interviews of user satisfaction within five organizations. Two groups were formed: satisfied and dissatisfied, and the results for a paired t-test for the mean of each group showed significant difference between them. Finally the reliability was determined by calculating Crombach's alpha for the two items which comprise each of the 13 factors, for the overall satisfaction, and for each of the three factors. All the reliabilities were above .80, which provided evidence that the questionnaire is internally consistent and thus reasonably free of measurement error.

The current research will extend their results in the sense that the organization utilized is a not for profit organization. In addition the system under study is characterized as a global network, which is evidenced by the questionnaire being responded by 43 persons of different countries both military and civilian. Also, this research will evaluate the sensitivity of user information satisfaction to the time of using the information product.

The elements of the System Effectiveness model to be covered in this research are information quality, system quality, and user satisfaction, which are characteristics of the system that will be addressed in order to answer the research questions.

Research Design

The purpose of the survey is to describe situations faced by the user of TMS in terms of his or her feelings of how effective is the current system. In this sense this survey does not intend to test theory or find causal relations. Therefore, a cross-sectional

approach will be useful in this context (Pinsonneault and Kraemer, 1993). This approach will allow the findings to be generalized safely from the sample to the population, and to describe characteristics of the population at the point in time the survey was conducted. After the data collection, the data will be analyzed aiming to provide answers to the three research questions stated in chapter I. This analysis will involve the development of marginal and cross-tabulations for the variables and will make use of simple descriptive statistics such as means, standard deviations and p-values. Based on the analysis, some suggestions will be provided in order to improve the quality of TMS in specific areas detected by the research.

The Sample Population

In first place, it is necessary to identify the respondent (Babbie, 1973). In this study the respondent will be the end user and it is important to make the distinction between the end user of information product and the operator of the program because the focus will be concentrated in the individual that makes use of the data and gets the benefits of the output. The target population will be the SAO training management personnel that analyze the data from the output reports and use them as a tool to manage the training program. The sample for this research was composed of 77 users located in several SAO in many countries. The sample frame was the list of about 90 % of the users of TMS provided by the TMS supporting office located in the Defense Institute of Security Assistance Management (DISAM) at Wright-Patterson AFB, Ohio.

The Data Collection Procedure

The survey was sent by e-mail to all SAO composing the sample frame, and the responses were received by e-mail or by fax. In the first round 29 respondents sent their evaluations for a response rate of 38%. During a follow on period of one week, 14 more respondents sent their responses and the final response rate was 56%. The second round included the option to send the responses by fax in addition to e-mail. The response rate of 56 % was considered excellent for this survey (Pinsonneault et al, 1993).

The Survey Instrument

This section describes how the survey instrument is structured in terms of its content, rating scales and reliability.

Content. The questionnaire is divided in two parts. The first part asks the respondent about demographic data: length of time using the system, military or civilian, and what version of system is currently being used. The second part is composed of 18 questions: 13 from the short-form questionnaire of Baroudi and Orlikowski (1988) and 5 suggested by the sponsoring agency. Respecting to the first 13 questions, the same wording was used with minor change only in the name of the specific system being evaluated (TMS) in lieu of the general electronic data processing (EDP). The questionnaire is reproduced in Appendix A.

Rating Scale. The second part uses a 7 point Likert scale for the questions. There are 2 items per scale and some of them were reversed score in order to minimize the tendency of respondents to simply mark down one column.

Reliability. "Reliability refers to the extent to which the questionnaire is free from measurement error. Synonyms for reliability include dependability, stability, consistency, predictability, and accuracy" (Stone, 1978). Utilizing the data collected in the survey and based on the replications above described, the reliability for the two items of each 13 scales and for each three factors was determined by calculating the Cronbach Alpha coefficient. The data were processed using the Statistic Analysis System (SAS). The results for the first case are reported in Table 1.

All the coefficient alpha reliability estimates are above .60. The maximum coefficient is .98 related to the scale relevance of output. The output data reported in Appendix C were generated by processing in the SAS program the raw data reported in Appendix B. Those data were utilized to build Table 1.

Table 1. Reliability Scores

Scale	Cronbach's Alpha
Relationship with TMS staff	.83
Processing of requests for changes	.81
Degree of TMS training provided	.73
User's understanding of system	.79
User's sense of participation	.88
Attitude of TMS staff	.83
Reliability of output	.90
Relevancy of output	.98
Accuracy of output	.64
Precision of output	.86
Communication with TMS staff	.88
Time required for new system development	.92
Completeness of output	.82

The results of reliability for each factor are reported on the diagonal of Table 2. Coefficient alpha estimates were .86, .79, and .74 for the information product, TMS staff and services, and knowledge and involvement scales, respectively. In addition, this table provides data for the mean and standard deviation for each factor. This table also presents the correlation among the factors in terms of Pearson coefficient. The results

show that there is significant correlation between factor 3 and factors 1 and 2 at $p<.0001$. Table 2 was built by using the output of data processed reported in Appendix D, which contains the correlation analysis results for the variables grouped in each of the three factors, and Appendix E, which contains the correlation analysis among the three factors themselves.

The analysis above provides evidence that the questionnaire is an internally consistent measure and thus reasonably free of measurement error. It measures what it intends to measure.

Table 2. Means, Standard Deviations, Intercorrelations, and Coefficient Alpha Reliability Estimates for the Study's Variables.

Variables	Mean	SD	1	2	3
1. Information Product	26.68	5.88	(.86)		
2. TMS staff and services	27.47	4.20	.30	(.79)	
3. Knowledge and involvement	18.76	4.57	.60**	.70**	(.74)

Note: N = 43 Cronbach alpha estimates appear on the diagonal
** statistically significant at $p<.01$

Methods of Analysis

The statistical method to be used for evaluate differences in perceived satisfaction for the two categories of users, military and civilian, will be the pared t-test. This procedure will be performed considering total satisfaction and each factor: information product, TMS staff and services, and knowledge and involvement.

In order to analyze the sensitivity of user satisfaction with the length of time using the system, it will be used the linear regression method for total satisfaction and each factor: information product, TMS staff and services, and knowledge and involvement.

IV. Results and Analysis

Introduction

This section reports the results of the survey based on the raw data processed. It will include results from demographic data such as distribution of years of use, proportions between military and civilian respondents, and proportions of using the two versions. In addition, this section will present the score results for each question, will perform paired t-test for each factor considering the differences between military/civilian and new version/old version. Finally, it will be reported the results of regression analysis considering each factor as the dependent variable and years of use as the independent variable.

Demographic Data

The first part of the survey collected the following demographic data:

Years of Use. This question asked the respondent to provide the number of years using the system. If less than one year is considered 0 years. The results are reported in Table 3. There are 13 respondents using TMS less than one year.

Table 3. Years of Using the System

Years	# of respondents	percent
0 (less than one)	13	30%
1	7	16%
2	8	19%
3	9	21%
4	4	9%
5 (or more)	2	5%

Civilian or Military. The results for this question showed that 20 military personnel and 22 civilians responded the question. There was one non respondent. This data resulted in 47% of the respondents were military, 51% civilian and 2% did not respond.

Version 3.1 or 4.0. This question asked the respondent to inform what version he or she uses currently. 12 use version 3.1, 28 use version 4.0, and 3 did not respond. This data resulted in 28% of the respondents use version 3.1, 65% use version 4.0 and 7% did not respond.

Score Results

The mean and standard deviation for each question from the standard questionnaire was calculated and reported in Table 4. The range for the mean goes from the minimum score 4.37 for **processing of requests for change** to the maximum score 6.29 for **attitude of TMS staff**. This latter scale also presented the minimum standard

deviation .93. The maximum standard deviation was 1.78 and was reported by the scale **degree of TMS training provided**. The total average satisfaction was calculated and scored 5.27 in a scale from 1 to 7. Table 4 was built by using the raw data in Appendix B and processed in the spreadsheet program Excel.

Also the mean and standard deviation for each added question proposed by the sponsoring agency (14,15, 16, 17, and 18) was calculated and reported in Table 5. The range for the mean goes from the minimum score 4.98 for **completeness of user documentation** to the maximum score 6.24 for **reliability of information provided by TMS staff.** Also that first scale presented the maximum standard deviation of 1.74 and this latter scale presented the minimum standard deviation of .86 showing more agreement among the surveyed. Table 5 was built by using the raw data in Appendix B and processed in the spreadsheet program Excel.

Table 4. Average Satisfaction Scores for Standard Questionnaire

Question	mean	SD
Relationship with TMS staff	5.99	1.11
Processing of requests for changes	4.37	1.52
Degree of TMS training provided	4.44	1.78
User's understanding of system	4.84	1.66
User's sense of participation	5.12	1.69
Attitude of TMS staff	6.29	.93
Reliability of output	5.32	1.66
Relevancy of output	5.97	1.33
Accuracy of output	5.42	1.50
Precision of output	5.06	1.61
Communication with TMS staff	6.05	1.05
Time required for new system development	4.78	1.35
Completeness of output	4.89	1.69
Total average	5.27	1.45

Table 5. Average Satisfaction Scores for Added Questions

Question	Mean	SD
Reliability of information provided by TMS staff	6.24	.86
Relevancy of information Provided by TMS	5.99	1.20
Accuracy of information provided by TMS staff	5.62	1.51
Precision of information provided by TMS staff	5.64	1.35
Completeness of user documentation provided with TMS program	4.98	1.74
Total average	5.69	1.33

<u>T-test for Total Satisfaction and Each Factor</u>

The p-values for the paired t-test are reported in Table 6. This table was built by using the data processed in SAS program and reported in Appendix F. They were calculated comparing the scores rated by the categories military versus civilian, and old version users versus new version users. The comparison was done for total user satisfaction by summing the scores on the 13 scales. For each factor the scores were calculated summing the scales loading in that factor. The results show that the difference in scores rated by the new and old version users with respect the quality of **information product** are statistically significant at $p< .01$. In addition, the variances for this test are

significantly unequal at p< .01. It was not detected statistically significant difference for the other two factors and the variances are significantly equal at p<.01 according to the data processed and reported in Appendix F. Also, no significant difference exist for the professional categories respect to each factor. Table 6 also reports the average scores for total satisfaction and each factor. The factor TMS staff and services got the highest score of 5.50 and the factor knowledge and involvement got the least score of 4.69. Information product got the score 5.33.

Table 6. P-values for paired t-test

Variable	Military/civilian	version old/new	avg. score
Total satisfaction	.307	.133	5.27
Information Product	.580	.001**	5.33
TMS staff and services	.194	.888	5.50
Knowledge and involvement	.243	.278	4.69

** statistically significant at p< .01

A further one tail t-test was performed assuming unequal variances and version 3.1 users reported a mean score greater than version 4.0 users statistically significant at p<.001. The results for this t-test are reported in Table 7.

Table 7. T-Test for Two-Sample Assuming Unequal Variances

	Version 3.1	Version 4.0
Mean	29,837083	24,982143
Variance	6,8057748	40,545966
Observations	12	28
Hypothesized Mean Difference	0	
Df	38	
t Stat	3,4199746	
P(T<=t) one-tail	0,0007548	
T Critical one-tail	1,6859531	
P(T<=t) two-tail	0,0015097	
t Critical two-tail	2,0243942	

Regression Analysis

It was performed a regression analysis between average satisfaction as the dependent variable and years of using TMS as the independent variable. The results are reported in Table 8 for total average satisfaction and for each factor separately. The beta coefficients and p-values were calculated using the raw data of Appendix B and processed in Excel. The data processed are reported in the Appendix G and were utilized to built Table 8. The results show that there is a statistically significant positive correlation at $p<.05$ between TMS staff and services, and years of using the system.

Table 8. Regression Analysis year x average satisfaction

Variable	Beta coefficient	p-value
Total Satisfaction	.14	.104
Information Product	.13	.302
TMS staff and services	.20	.014*
Knowledge and involvement	.22	.054

* statistically significant at $p< .05$

These results can also be visualized in the graphic of Figure 3. This graphic shows the effect of the positive correlation and the increase of average satisfaction with TMS staff and services as the time of using the system increases.

The beta coefficient indicates that the average satisfaction with TMS staff and services increases at an average rate of .20 each year.

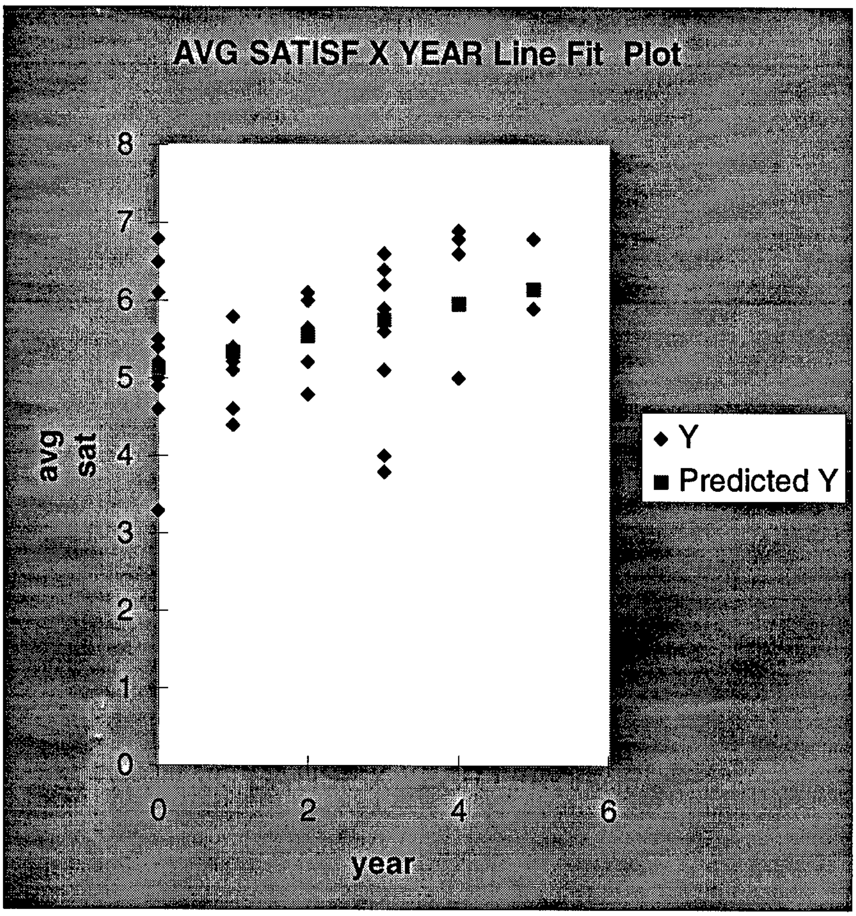

Figure 4. Linear Regression Plot

V. Conclusions and Recomendations

This chapter is divided in two sections. The first section draws the conclusions based on the results previously analyzed in chapter IV. The second section addresses some practical recommendations to the support staff of TMS, based on the conclusions.

Conclusions.

The objective of this section is to answer the research questions stated in the beginning of this research, based on the results analyzed in the previous chapter.

Question 1. What is the system effectiveness regarding to the level of product quality provided by TMS?

In order to answer this question we need to report the data analyzed related to the specific factor **information product.** This factor relates to the scales measuring reliability, relevancy, accuracy, precision and completeness of output information provided by TMS. The average combined score for these scales can provide a good indicative of customer satisfaction with the quality of product information provided by TMS. According to the previous results the average score for this factor is 5.33 in a scale from 1 to 7. This means that the product information was rated above the average and therefore it is a very good quality product under the view of the user. Another aspect to be addressed is the statistically significant difference pointed by the results related to versions 3.1 and 4.0.

According to the results, users of version 3.1 rated this version higher than users of version 4.0. In general, it is expected the user be more satisfied with new versions

because new versions correct any previous flaws of older versions. For example, new versions sometimes bring improvements in user-software interfaces. In order to explain the possible reasons for this outcome it is necessary to report that 28 users are using version 4.0. In addition, according to the data reported in Table 3, 13 users of the total surveyed are using TMS for less than one year. Since version 4.0 was fielded in less than one year (spring of 1996), it is likely that approximately 46% (13/28) of users of version 4.0 have used only this version. The other 54% of users of version 4.0 have used version 3.1 before and were able to compare the quality of the two versions respecting to product information, therefore rating version 4.0 less than they would have rated version 3.1.

Question 2. What is the level of involvement and knowledge of TMS' user related to the information services function?

This factor relates to issues in processing of requests for changes in the system, degree of training provided to the users, user's understanding of TMS, and user's feeling of participation. According to the results the average score for this factor was 4.69. This opinion is shared by both military and civilian users, and also by users of version 3.1 and 4.0. This outcome results from the fact that there was not significant difference among them with respect to this factor. This means that in a general sense, there is enough room for improvements in this area and some practical recommendations can be addressed in this area.

Question 3. What is the level of user perceived satisfaction with the staff and service provided by support people of TMS?

More specifically, the scales utilized to measure this factor are: relationship with the DISAM TMS support team, processing of requests for changes in TMS, perceived attitude of the TMS support staff, communication with the TMS support staff, and time required for development of version 4.0.

The average score for this factor was 5.50 which is a very good score, and in addition it is the highest among the three factors. Also, it is important to note that there is a common sense pointing to this opinion. There is no significant difference among military and civilians as well as among users of version 3.1 and users of version 4.0 with respect the perceived satisfaction with TMS staff and services provided.

Question 4. What is the perceived difference in levels of satisfaction between military and civilian for each of the questions 1,2 and 3 above?

According to the results, there was no statistically significant difference between the professional category respect to all the three factors. It means that professional category (civilian/military) has no influence on the level of satisfaction for the three factors considered.

Question 5. What is the impact of experience with the system on questions 1 to 3 above?

The results show that satisfaction with information product provided by TMS does not depend on the years of usage. This conclusion results from the linear regression analysis performed, which showed no significant beta coefficient for this factor.

Also, according to the results of regression analysis, knowledge and involvement are not dependent on the time of experience the user has in the system. In other words a new user tends to present the same level of perceived satisfaction with this factor as an

old user presents. This outcome results from the fact that the beta coefficient is not statistically significant at $p<.05$ for this factor. Therefore it is possible to conclude that the perceived satisfaction in relation to knowledge and involvement has not changed with the time. This conclusion supports the fact that it is necessary to perform improvements in this area.

Finally, the regression analysis presented a significant positive coefficient beta for the factor TMS staff and services versus time. It means that the perceived satisfaction with TMS staff and the services provided tends to increase with the time of experience the user has in the system. This result can be attributed to more involvement with the TMS staff, and increased knowledge of the services available as the time of experience in the system increases.

<u>Recommendations for TMS Staff</u>

1. Following demonstrated customer satisfaction with the older, TMS version 3.1, it is recommended that DISAM establish a program to identify those users of version 4.0 who, having used both versions, rated version 4.0 less than they would have rated version 3.1. This would enable DISAM to concentrate on assisting those personnel and thus assuring their acceptance of the TMS 4.X software as TMS 4.1 is fielded in its final form.

2. It is further recommended that DISAM adopt a numbering scheme for their software versions in line with that of commercial software venders. Thus, initial "trial" versions would be numbered as *beta* versions, not as if they were "final" versions. This

would help to instill confidence new final versions of the software by distinguishing between a final version and a "test" or *beta* version.

3. It is also recommended that DISAM continue to include the end user in developmental efforts, thus helping the end user to feel it is "his/her" contributions that are helping in the software development.

4. It is recommended that DISAM aggressively communicate to the field the status of software development. Only in this way will the users understand what is expected of them and specifically which version of the software they should be using, etc. Interrelationship with the SAN should also be emphasized.

Recommendations for Future Research

It is recommended for further research that the dimensions not covered in the questionnaire used in this research project, namely, **use, individual impact, and organizational impact,** be investigated in a further literature review in order to develop one instrument or to find the availability of one already validated involving the three cited dimensions when considered jointly or separately. In addition, this instrument could be used to replicate the findings of this research project and compare the results under the different dimensions in the model proposed by DeLone and McLean (1992).

Summary

This research had the objective to add to the body of knowledge issues pertaining to the effectiveness of information systems, in particular the Training Management

System of DISAM. It used an instrument already developed involving three dimensions of the construct information system success. The findings were used to point out areas for improvement in effectiveness of TMS and as a result to provide practical recommendations for that improvement.

Appendix A: Survey

The following 13 questions questionnaire on the use and support of the Training Management System (TMS) is being provided by Major Paulo Ruy of the Brazilian Air Force. Major Ruy is a student at the Air Force Institute of Technology and this questionnaire and his subsequent analysis of responses will be a part of his masters degree thesis. Major Ruy is funded under an FMS case.
The person completing the questionnaire should be the person who is the primary user of the TMS program and, hopefully, the person who has the most experience with TMS. Please complete the questionnaire on-line on the SAN (IDSS) and send it as an E-mail message to PRUY on the SAN (IDSS). Major Ruy is a registered user on IDSS.

Your cooperation in completing and returning this questionnaire to Major Ruy is greatly appreciated. It will obviously contribute to his successful accomplishment of his degree work, but in addition we at DISAM will receive an excellent analysis of our efforts in fielding and supporting the TMS software.

Thank you,
Mr. Charles Collins
Associate Professor, DISAM

QUESTIONNAIRE FOR MEASUREMENTS OF USER INFORMATION SATISFACTION

The purpose of this study is to measure how <u>you</u> feel about certain aspects of the Training Management System (TMS) and the support you have been provided. On the following pages you will find different factors, each related to some aspect of your TMS support. You are to rate each factor on the descriptive scales that follow it, based on your evaluation of the factor.

The scale positions are defined as follows:

adjective X 1 2 3 4 5 6 7 adjective Y

1--extremely X
2--quite X
3--slightly X
4--neither X or Y; equally X or Y; does not apply
5--slightly Y
6--quite Y
7--extremely Y

The following example illustrates the scale positions and their meanings:

My vacation in Hawaii was:	(7)	restful 1 2 3 4 5 6 7 hectic
	(2)	healthy 1 2 3 4 5 6 7 unhealthy

According to the responses, the person's vacation was extremely hectic and quite healthy.

INSTRUCTIONS

1. Place beside each scale the number corresponding the position that describes your evaluation of the factor being judged.
2. Judge every scale; do not omit any.
3. Chose only one number for each scale.
4. Work rapidly. Rely on your first impressions.

Thank you very much for your cooperation.

COMPLETE THE SPACES

I am using TMS for __ years (If less than 1 year, put "0"; otherwise put 1,2 3...)

I am ___ (military - 1; civilian - 2)

My responses are based on the use of TMS Version ___ (If 3.1 enter "1" ; if 4.0 enter "2")

ANSWER BASED ON YOUR FEELINGS.

1. Relationship with the DISAM TMS support staff.	( )	dissonant 1 2 3 4 5 6 7 harmonious
	( )	bad 1 2 3 4 5 6 7 good
2. Processing of requests for changes in TMS	( )	fast 1 2 3 4 5 6 7 slow
	( )	untimely 1 2 3 4 5 6 7 timely
3. Degree of TMS training provided to users.	( )	complete 1 2 3 4 5 6 7 incomplete
	( )	low 1 2 3 4 5 6 7 high
4. User's understanding of the TMS.	( )	insufficient 1 2 3 4 5 6 7 sufficient
	( )	complete 1 2 3 4 5 6 7 incomplete
5. User's feelings of participation.	( )	positive 1 2 3 4 5 6 7 negative
	( )	insufficient 1 2 3 4 5 6 7 sufficient
6. Attitude of the TMS support staff.	( )	cooperative 1 2 3 4 5 6 7 belligerent
	( )	negative 1 2 3 4 5 6 7 positive
7. Reliability of output information provided by TMS	( )	high 1 2 3 4 5 6 7 low
	( )	superior 1 2 3 4 5 6 7 inferior
8. Relevancy of output information	( )	useful 1 2 3 4 5 6 7 useless

provided by TMS (to intended function)	( )	relevant 1 2 3 4 5 6 7 irrelevant
9. Accuracy of output information provided	( )	inaccurate 1 2 3 4 5 6 7 accurate
by TMS.	( )	low 1 2 3 4 5 6 7 high
10. Precision of output information provided	( )	low 1 2 3 4 5 6 7 high
by TMS.	( )	definite 1 2 3 4 5 6 7 uncertain
11. Communication with the TMS	( )	dissonant 1 2 3 4 5 6 7harmonious
support staff.	( )	destructive 1 2 3 4 5 6 7 productive
12. Time required for TMS 4.0	( )	unreasonable 1 2 3 4 5 6 7 reasonable
development.	( )	acceptable 1 2 3 4 5 6 7 unacceptable
13. Completeness of output information	( )	sufficient 1 2 3 4 5 6 7 insufficient
provided by TMS.	( )	adequate 1 2 3 4 5 6 7 inadequate
14. Reliability of information	( )	high 1 2 3 4 5 6 7 low
provided by TMS staff.	( )	superior 1 2 3 4 5 6 7 inferior
15. Relevancy of information by TMS staff	( )	useful 1 2 3 4 5 6 7 useless
	( )	relevant 1 2 3 4 5 6 7 irrelevant
16. Accuracy of information	( )	inaccurate 1 2 3 4 5 6 7 accurate
provided by TMS staff	( )	low 1 2 3 4 5 6 7 high
17. Precision of information	( )	low 1 2 3 4 5 6 7 high
provided by TMS staff	( )	definite 1 2 3 4 5 6 7 uncertain
18. Completeness of user documentation	( )	sufficient 1 2 3 4 5 6 7 insufficient
provided with TMS program	( )	adequate 1 2 3 4 5 6 7 inadequate

Appendix B: Raw Data

Surv #	year	mil/civ	version	1a	1b	2a	2b	3a	3b
1	2	1	2	6	6	4	4	2	2
2	3	2	1	6	6	4.24	4.39	6	6
3	0	1	2	5	5	4	4	6	6
4	2	1	2	2	6	4	4	6	6
5	5	2	2	7	7	7	7	7	6
6	2	1	2	7	7	4	4	2	2
7	3	2	2	7	7	5	5	7	7
8	0	2	2	7	7	2	6	4	4
9	5	2	2	6	6	5	5	6	6
10	2	1	1	5	5	4	4	2	2
11	4	1	1	7	6	4	4	1	6
12	0	1	2	7	7	4	4	4	4
13	4	2		7	7	7	7	5	6
14	0	2	1	6	6	3	5	1	1
15	1	1		6	6	4	4	2	3
16	0	1	2	6	5	3	3	3	3
17	1	2	1	6	6	6	6	5	5
18	0	1	2	6	6	2	2	3	5
19	3	2	2	7	6.07	5	6	2	2
20	0	1	1	7	7	6	5	6	5
21	0	1	1	7	7	4	4	5	5
22	0	1	1	4	4	4	4	6	6
23	0	1	2	4	4	4	4	2	6
24	0			4	4	1	1	6	5
25	0	1	2	6	7	6	7	6	6
26	1	2	2	6	7	1	1	2	2
27	1	2	2	7	6	3	5	2	6
28	3	1	1	7	7	6	6	7	7
29	0	2	2	6	7	6	2	6	6
30	2	2	1	6	7	6	6	4	4
31	3	2	2	4	4	4	4	4	4
32	3	1	2	7	7	2	2	6	6
33	1	1	2	5	6	5	4	3	2
34	3	2	2	5	6	4	4	6	6
35	4	2	2	7	7	6	6	5	5
36	4	2	2	7	7	6	7	4	4
37	3	2	2	6	5	5	6	7	7
38	1	2	2	6	5	3	3	4	3
39	2	1	2	6	7	2	6	3	6
40	2	2	2	7	7	4	4	7	1
41	2	2	1	6	7	6	6	4	4
42	3	2	1	4	4	4	4	3	4
43	1	1	2	4	5	3	4	4	4

Surv #	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b

1	6	6	4	4	6	6	1	1	7	7
2	7	7	7	7	7	7	6	5.09	7	7
3	5	5	5	5	6	6	7	7	6	6
4	1	2	6	6	6	6	6	6	6	6
5	7	7	6	6	7	7	5	5	6	6
6	2	2	1	1	7	7	1	1	2	2
7	6	5	7	6	7	7	7	2	7	6
8	5	5	6	6	7	7	7	6	6	6
9	5	5	5	5	6	6	5	6	5	5
10	6	3	4	4	5	5	6	6	6	6
11	7	1	1	6	2	6	6	6	7	7
12	6	6	7	7	7	7	7	4	7	7
13	6	6	7	7	7	7	7	7	7	7
14	6	6	7	7	7	6	6	6	7	7
15	3	3	5	4	6	6	7	6	7	7
16	3	3	4	4	6	6	3	3	6	6
17	5	5	6	3	6	6	6	6	5	5
18	6	6	5	5	6	5	6	5	6	6
19	3	2	7	6	7	7	6	5	5	5
20	5	6	6	6	7	7	7	7	7	7
21	5	5	4	4	6	6	6	6	6	6
22	4	4	7	7	7	7	4	4	7	7
23	5	3	5	3	6	6	5	5	6	6
24	5	6	4	4	6	5	5	6	5	5
25	7	6	7	7	7	7	6	6	7	7
26	6	3	1	1	7	7	1	1	1	1
27	3	3	6	3	6	7	6	6	7	7
28	7	7	7	7	7	7	7	7	7	7
29	5	6	6	5	6	6	4	3	7	7
30	6	5	6	6	7	7	7	7	7	7
31	2	2	1	1	4	4	7	7	6	6
32	6	6	5	5	7	7	6	6	6	6
33	4	3	4	4	6	6	4	4	3	4
34	6	6	6	6	6	6	5	5	4	4
35	6	6	6	5	7	7	6	6	7	7
36	7	7	7	6	7	7	6	6	6	6
37	5	3	7	6	7	7	5	5	6	6
38	2	2	4	3	6	6	2	3	4	6
39	6	6	6	6	7	6	5	6	6	6
40	6	2	6	6	7	7	6	6	6	6
41	6	5	6	6	7	7	7	7	7	7
42	4	4	5	4	4	4	6	6	6	6
43	6	6	4	4	5	5	6	6	7	7
Surv #	9a	9b	10a	10b	11a	11b	12a	12b	13a	13b

Surv #	14a	14b	15a	15b	16a	16b	17a	17b	18a	18b
1	2	2	2	2	6	6	6	6	6	6
2	7	7	7	7	6	6	4.71	4.73	5	6
3	2	6	3	5	6	6	4	4	6	6
4	2	6	6	6	6	6	6	6	5	2
5	6	6	6	6	7	7	6	6	6	6
6	1	7	1	1	7	7	3	3	2	2
7	7	7	7	6	7	7	6	6	6	6
8	6	6	6	5	6	7	6	6	2	6
9	5	5	4	2	6	5	7	7	2	6
10	6	6	5	5	5	5	5	5	6	6
11	7	7	6	6	7	7	4	3	2	2
12	7	7	6	6	4	4	2	4	4	4
13	7	7	7	7	7	7	6	6	6	6
14	5	5	6	6	6	6	5	5	3	6
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16	4	4	4	4	4	4	6	7	3	3
17	2	6	6	6	6	6	5	5	6	6
18	5	5	3	3	6	6	4	3	3	5
19	6	6	6	5	5	7	7	5	6	2
20	6	6	6	6	7	7	6	6	6	6
21	6	6	6	6	6	6	4	4	5	5
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23	5	6	5	3	7	6	4	4	6	6
24	3	6	5	5	4	4	3	1	4	4
25	7	7	7	6	7	7	7	7	7	7
26	3	1	1	2	6	3	5	3	1	1
27	6	6	6	2	6	6	4	4	6	6
28	7	6	7	7	7	7	6	6	3	3
29	5	5	5	4	5	6	5	6	6	6
30	6	6	6	7	7	7	4	4	7	7
31	6	6	6	6	4	4	3	3	7	7
32	6	6	6	6	7	6	7	7	2	2
33	6	4	5	3	6	6	3	4	3	3
34	6	6	5	5	6	6	4	4	5	5
35	6	6	6	6	7	7	6	6	6	6
36	4	4	5	4	7	7	7	7	4	4
37	6	6	6	2	7	7	4	3	4	4
38	3	3	3	2	5	4	3	3	4	3
39	6	5	4	5	6	7	4.71	4.73	6	5
40	6	6	6	6	7	7	5	5	5	5
41	6	6	6	7	7	7	4	4	7	7
42	6	6	6	6	4	4	4	4	6	6
43	7	7	6	6	6	6	4	4	7	7

1	6	6	6	6	5	5	5	5	6	6
2	6	6	6	6	6	6	7	7	6	6
3	6	6	6	6	6	5	5	6	2	2
4	6	6	6	6	6	6	6	6	6	6
5	7	7	7	7	7	7	7	7	7	7
6	7	5	7	7	6	6	6	6	1	1
7	7	7	7	7	1	6	6	6	6	6
8	6	6	6	6	2	2	2	6	5	5
9	6	6	4	4	6	6	4	4	1	1
10	3	3	5	5	5	5	5	5	3	3
11	7	7	6	6	7	7	6	6	7	7
12	6	6	7	7	6	6	6	2	6	6
13	7	7	7	7	7	7	7	7	7	7
14	7	7	7	7	6	6	6	6	1	4
15	6	6	6	6	6	6	6	2	3	3
16	6	6	6	6	7	7	6	6	3	3
17	6	6	6	6	6	6	6	6	5	5
18	6	5	6	6	6	6	5	5	2	2
19	6	5	5	6	7	7	7	5	6	6
20	7	7	7	7	7	7	7	7	7	7
21	7	7	7	7	1	1	7	7	6	6
22	7	7	6	6	6	6	6	6	6	6
23	6	6	5	5	6	5	7	6	4	4
24	4	4	4	4	4	4	4	4	4	4
25	7	6	7	7	7	7	7	6	6	6
26	7	7	1	1	3	2	3	2	3	3
27	7	7	7	7	6	6	6	7	7	7
28	7	7	7	7	7	7	6	6	7	7
29	5	5	6	6	5	6	6	6	6	6
30	7	7	7	7	6	6	6	7	6	6
31	7	7	4	4	4	4	6	6	6	6
32	7	7	7	7	7	7	7	7	4.95	5
33	6	5	6	5	3	5	5	4	6	5
34	6	6	5	5	6	6	5	5	4	4
35	6	7	7	7	6	7	6	6	6	6
36	7	7	7	7	7	7	7	7	6	6
37	6	6	6	6	5	6	6	6	6	6
38	6	6	6	6	5	5	6	2	3	3
39	6	6	5	4	6	6	6	5	6	6
40	7	7	7	7	7	7	7	7	4	4
41	7	7	7	7	6	6	6	7	6	6
42	6	6	5	5	6	6	6	2	6	6
43	6	6	6	6	2	6	4	4	4	4

Appendix C: Correlation Analysis

The SAS System 1
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V1A V1B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V1A	43	5.9070	1.1915	254.0000	2.0000	7.0000
V1B	43	6.0714	1.0326	261.0700	4.0000	7.0000

The SAS System 2
13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.834180
for STANDARDIZED variables: 0.839147

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V1A	0.722871	.	0.722871	.
V1B	0.722871	.	0.722871	.

The SAS System 3
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V1A	V1B
V1A	1.00000 0.0	0.72287 0.0001
V1B	0.72287 0.0001	1.00000 0.0

Correlation Analysis

2 'VAR' Variables: V2A V2B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V2A	43	4.2381	1.5089	182.2400	1.0000	7.0000
V2B	43	4.4974	1.5315	193.3900	1.0000	7.0000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.816746
for STANDARDIZED variables: 0.816799

Raw Variables Std. Variables

Deleted Correlation Correlation

Variable	with Total	Alpha	with Total	Alpha
V2A	0.690331	.	0.690331	.
V2B	0.690331	.	0.690331	.

The SAS System 6
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V2A	V2B
V2A	1.00000 0.0	0.69033 0.0001
V2B	0.69033 0.0001	1.00000 0.0

The SAS System 7
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V3A V3B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V3A	43	4.3256	1.8480	186.0000	1.0000	7.0000
V3B	43	4.5581	1.7224	196.0000	1.0000	7.0000

The SAS System 8
13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.736877
for STANDARDIZED variables: 0.738029

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V3A	0.584823	.	0.584823	.
V3B	0.584823	.	0.584823	.

The SAS System 9
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V3A	V3B
V3A	1.00000 0.0	0.58482 0.0001
V3B	0.58482 0.0001	1.00000 0.0

The SAS System 10
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V4A V4B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V4A	43	5.0930	1.5555	219.0000	1.0000	7.0000
V4B	43	4.5814	1.7352	197.0000	1.0000	7.0000

The SAS System 11
13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.797745
for STANDARDIZED variables: 0.800606

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V4A	0.667509	.	0.667509	.
V4B	0.667509	.	0.667509	.

The SAS System 12
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V4A	V4B
V4A	1.00000	0.66751
	0.0	0.0001
V4B	0.66751	1.00000
	0.0001	0.0

The SAS System 13

13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V5A V5B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V5A	43	5.2558	1.7333	226.0000	1.0000	7.0000
V5B	43	4.9767	1.6546	214.0000	1.0000	7.0000

The SAS System 14

13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.877463
for STANDARDIZED variables: 0.877995

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V5A	0.782524	.	0.782524	.
V5B	0.782524	.	0.782524	.

The SAS System 15
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V5A	V5B
V5A	1.00000 0.0	0.78252 0.0001
V5B	0.78252 0.0001	1.00000 0.0

The SAS System 16
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V6A V6B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V6A	43	6.2791	1.0311	270.0000	2.0000	7.0000
V6B	43	6.3023	0.8319	271.0000	4.0000	7.0000

The SAS System 17
13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.834130
for STANDARDIZED variables: 0.845261

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V6A	0.731994	.	0.731994	.
V6B	0.731994	.	0.731994	.

The SAS System 18
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V6A	V6B
V6A	1.00000 0.0	0.73199 0.0001
V6B	0.73199 0.0001	1.00000 0.0

The SAS System 19
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V7A V7B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V7A	43	2.5581	1.6662	110.0000	1.0000	7.0000
V7B	43	2.7842	1.6696	119.7200	1.0000	7.0000

The SAS System 20
13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.903011
for STANDARDIZED variables: 0.903012

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V7A	0.823174	.	0.823174	.
V7B	0.823174	.	0.823174	.

The SAS System 21
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V7A	V7B
V7A	1.00000 0.0	0.82317 0.0001
V7B	0.82317 0.0001	1.00000 0.0

The SAS System 22
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V8A V8B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum

V8A	43	2.0465	1.3793	88.0000	1.0000	7.0000
V8B	43	2.0000	1.2910	86.0000	1.0000	7.0000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.979902
for STANDARDIZED variables: 0.980996

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V8A	0.962700	.	0.962700	.
V8B	0.962700	.	0.962700	.

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V8A	V8B
V8A	1.00000 0.0	0.96270 0.0001

V8B	0.96270	1.00000
	0.000	0.0

The SAS System 25
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V9A V9B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V9A	43	5.2326	1.6596	225.0000	1.0000	7.0000
V9B	43	5.6047	1.3118	241.0000	1.0000	7.0000

The SAS System 26
13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.647138
for STANDARDIZED variables: 0.659185

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V9A	0.491630	.	0.491630	.
V9B	0.491630	.	0.491630	.

The SAS System 27
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V9A	V9B
V9A	1.00000 0.0	0.49163 0.0008
V9B	0.49163 0.0008	1.00000 0.0

The SAS System 28
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V10A V10B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V10A	43	5.2326	1.5093	225.0000	1.0000	7.0000
V10B	43	4.8837	1.7073	210.0000	1.0000	7.0000

The SAS System 29
13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.859402
for STANDARDIZED variables: 0.863117

	Raw Variables	Std. Variables
Deleted	Correlation	Correlation

Variable	with Total	Alpha	with Total	Alpha
V10A	0.759195	.	0.759195	.
V10B	0.759195	.	0.759195	.

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V10A	V10B
V10A	1.00000 0.0	0.75920 0.0001
V10B	0.75920 0.0001	1.00000 0.0

Correlation Analysis

2 'VAR' Variables: V11A V11B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V11A	43	6.0698	0.9855	261.0000	4.0000	7.0000
V11B	43	6.0233	1.1231	259.0000	3.0000	7.0000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.881243
for STANDARDIZED variables: 0.885444

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V11A	0.794436	.	0.794436	.
V11B	0.794436	.	0.794436	.

The SAS System 33
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V11A	V11B
V11A	1.00000 0.0	0.79444 0.0001
V11B	0.79444 0.0001	1.00000 0.0

The SAS System 34
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V12A V12B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V12A	43	4.8237	1.3078	207.4200	2.0000	7.0000
V12B	43	4.7316	1.4146	203.4600	1.0000	7.0000

The SAS System 35
13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.925425
for STANDARDIZED variables: 0.926957

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V12A	0.863858	.	0.863858	.
V12B	0.863858	.	0.863858	.

The SAS System 36
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V12A	V12B
V12A	1.00000 0.0	0.86386 0.0001
V12B	0.86386 0.0001	1.00000 0.0

The SAS System 37
13:21 Friday, April 18, 1997

Correlation Analysis

2 'VAR' Variables: V13A V13B

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V13A	43	3.1628	1.7034	136.0000	1.0000	7.0000
V13B	43	3.0465	1.6897	131.0000	1.0000	7.0000

The SAS System 38
13:21 Friday, April 18, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.823849
for STANDARDIZED variables: 0.823865

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V13A	0.700485	.	0.700485	.
V13B	0.700485	.	0.700485	.

The SAS System 39
13:21 Friday, April 18, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V13A	V13B
V13A	1.00000 0.0	0.70048 0.0001
V13B	0.70048 0.0001	1.00000 0.0

Appendix D: Correlation Analysis

The SAS System 112
14:19 Wednesday, April 23, 1997

Correlation Analysis

5 'VAR' Variables: V7 V8 V9 V10 V13

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V7	43	5.3288	1.5925	229.1400	1.0000	7.0000
V8	43	5.9767	1.3227	257.0000	1.0000	7.0000
V9	43	5.4186	1.2861	233.0000	2.0000	7.0000
V10	43	5.0581	1.5087	217.5000	1.0000	7.0000
V13	43	4.8953	1.5643	210.5000	1.0000	7.0000

The SAS System 113
14:19 Wednesday, April 23, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.865249
for STANDARDIZED variables: 0.868381

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V7	0.757278	0.818378	0.759495	0.823648
V8	0.699722	0.835082	0.695753	0.839681
V9	0.697068	0.836419	0.694914	0.839889
V10	0.804756	0.805579	0.809130	0.810837
V13	0.509385	0.883159	0.512510	0.883233

The SAS System 114

14:19 Wednesday, April 23, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V7	V8	V9	V10	V13
V7	1.00000 0.0	0.57332 0.0001	0.67268 0.0001	0.78741 0.0001	0.42340 0.0047
V8	0.57332 0.0001	1.00000 0.0	0.50976 0.0005	0.61814 0.0001	0.58567 0.0001
V9	0.67268 0.0001	0.50976 0.0005	1.00000 0.0	0.76329 0.0001	0.33888 0.0262
V10	0.78741 0.0001	0.61814 0.0001	0.76329 0.0001	1.00000 0.0	0.41625 0 .0055

The SAS System 115

14:19 Wednesday, April 23, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V7	V8	V9	V10	V13
V13	0.42340 0.0047	0.58567 0.0001	0.33888 0.0262	0.41625 0.0055	1.00000 0.0

The SAS System 116

14:19 Wednesday, April 23, 1997

Correlation Analysis

5 'VAR' Variables: V1 V2 V6 V11 V12

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V1	43	5.9892	1.0326	257.5350	4.0000	7.0000
V2	43	4.3678	1.3976	187.8150	1.0000	7.0000
V6	43	6.2907	0.8676	270.5000	4.0000	7.0000
V11	43	6.0465	0.9989	260.0000	4.0000	7.0000
V12	43	4.7777	1.3141	205.4400	2.0000	7.0000

The SAS System 117
14:19 Wednesday, April 23, 1997

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.790171
for STANDARDIZED variables: 0.806123

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V1	0.589241	0.745750	0.613188	0.761930
V2	0.578401	0.755000	0.572186	0.774574
V6	0.599352	0.750408	0.619234	0.760044
V11	0.641889	0.731685	0.642756	0.752651
V12	0.516851	0.773305	0.510010	0.793254

The SAS System 118
14:19 Wednesday, April 23, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V1	V2	V6	V11	V12
V1	1.00000 0.0	0.37079 0.0144	0.61578 0.0001	0.47372 0.0013	0.41307 0.0059
V2	0.37079 0.0144	1.00000 0.0	0.35772 0.0185	0.59292 0.0001	0.44633 0.0027
V6	0.61578 0.0001	0.35772 0.0185	1.00000 0.0	0.52661 0.0003	0.38860 0.0100
V11	0.47372 0.0013	0.59292 0.0001	0.52661 0.0003	1.00000 0.0	0.35469 0.0196

The SAS System 119
14:19 Wednesday, April 23, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V1	V2	V6	V11	V12
V12	0.41307 0.0059	0.44633 0.0027	0.38860 0.0100	0.35469 0.0196	1.00000 0.0

The SAS System 120
14:19 Wednesday, April 23, 1997

Correlation Analysis

4 'VAR' Variables: V2 V3 V4 V5

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
V2	43	4.3678	1.3976	187.8150	1.0000	7.0000
V3	43	4.4419	1.5894	191.0000	1.0000	7.0000
V4	43	4.8372	1.5029	208.0000	1.5000	7.0000
V5	43	5.1163	1.5992	220.0000	1.0000	7.0000

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.740167
for STANDARDIZED variables: 0.738456

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
V2	0.462432	0.718331	0.460148	0.718377
V3	0.486245	0.708678	0.482763	0.705924
V4	0.505457	0.696136	0.499899	0.696368
V5	0.687553	0.583906	0.690313	0.582958

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	V2	V3	V4	V5
V2	1.00000 0.0	0.29628 0.0537	0.28005 0.0689	0.52775 0.0003
V3	0.29628 0.0537	1.00000 0.0	0.37720 0.0126	0.47575 0.0013
V4	0.28005 0.0689	0.37720 0.0126	1.00000 0.0	0.52567 0.0003
V5	0.52775 0.0003	0.47575 0.0013	0.52567 0.0003	1.00000 0.0

Appendix E: Correlation Analysis

The SAS System 1
09:03 Friday, April 25, 1997

Correlation Analysis

3 'VAR' Variables: IPSUM EDPSUM KISUM

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
IPSUM	43	26.6777	5.8857	1147	6.5000	34.0000
EDPSUM	43	27.4719	4.2025	1181	16.5000	34.5000
KISUM	43	18.7631	4.5711	806.8150	8.5000	27.0000

The SAS System 2
09:03 Friday, April 25, 1997

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 43

	IPSUM	EDPSUM	KISUM
IPSUM	1.00000	0.29896	0.60248
	0.0	0.0515	0.0001
EDPSUM	0.29896	1.00000	0.70034
	0.0515	0.0	0.0001
KISUM	0.60248	0.70034	1.00000
	0.0001	0.0001	0.0

Appendix F: T-Test

The SAS System 135
14:19 Wednesday, April 23, 1997

TTEST PROCEDURE

Variable: TOTAL

MIL	N	Mean	Std Dev	Std Error	Minimum	Maximum
1	20	67.01100000	10.32632298	2.30903601	43.00000000	87.00000000
2	22	70.53227273	11.61568918	2.47647325	37.00000000	86.50000000

Variances	T	DF	Prob>|T|
Unequal	-1.0400	40.0	0.3046
Equal	-1.0340	40.0	0.3073

For H0: Variances are equal, F' = 1.27 DF = (21,19) Prob>F' = 0.6101

The SAS System 136
14:19 Wednesday, April 23, 1997

TTEST PROCEDURE

Variable: IP

MIL	N	Mean	Std Dev	Std Error	Minimum	Maximum
1	20	26.20000000	5.77289492	1.29085855	10.00000000	33.50000000
2	22	27.23363636	6.18453797	1.31854793	6.50000000	34.00000000

Variances	T	DF	Prob>|T|
Unequal	-0.5602	40.0	0.5785
Equal	-0.5583	40.0	0.5798

For H0: Variances are equal, F' = 1.15 DF = (21,19) Prob>F' = 0.7673

The SAS System 137

14:19 Wednesday, April 23, 1997

TTEST PROCEDURE

Variable: EDP

MIL	N	Mean	Std Dev	Std Error	Minimum	Maximum
1	20	26.91100000	3.18986867	0.71327632	23.00000000	34.00000000
2	22	28.48045455	4.36099620	0.92976751	19.00000000	34.50000000

Variances	T	DF	Prob>|T|
Unequal	-1.3393	38.3	0.1884
Equal	-1.3196	40.0	0.1945

For H0: Variances are equal, F' = 1.87 DF = (21,19) Prob>F' = 0.1757

The SAS System 138
14:19 Wednesday, April 23, 1997

TTEST PROCEDURE

Variable: KI

MIL	N	Mean	Std Dev	Std Error	Minimum	Maximum
1	20	17.95000000	4.34953113	0.97258473	9.00000000	27.00000000
2	22	19.62795455	4.78501646	1.02016894	8.50000000	26.50000000

Variances	T	DF	Prob>|T|
Unequal	-1.1905	40.0	0.2409
Equal	-1.1850	40.0	0.2430

For H0: Variances are equal, F' = 1.21 DF = (21,19) Prob>F' = 0.6800

The SAS System 139
14:19 Wednesday, April 23, 1997

TTEST PROCEDURE

Variable: TOTAL

VERSION	N	Mean	Std Dev	Std Error
1	12	72.76458333	7.87005587	2.27188944
2	28	66.59839286	11.65687455	2.20294222

Variances	T	DF	Prob>|T|
Unequal	1.9485	30.4	0.0606
Equal	1.6703	38.0	0.1031

For H0: Variances are equal, F' = 2.19 DF = (27,11) Prob>F' = 0.1715

The SAS System 140
14:19 Wednesday, April 23, 1997

TTEST PROCEDURE

Variable: IP

VERSION	N	Mean	Std Dev	Std Error
1	12	29.84500000	2.61623081	0.75524078
2	28	24.98214286	6.36757141	1.20335789

Variances	T	DF	Prob>|T|
Unequal	3.4228	38.0	0.0015
Equal	2.5399	38.0	0.0153

For H0: Variances are equal, F' = 5.92 DF = (27,11) Prob>F' = 0.0036

The SAS System 141
14:19 Wednesday, April 23, 1997

TTEST PROCEDURE

Variable: EDP

VERSION	N	Mean	Std Dev	Std Error
1	12	27.75291667	3.72056475	1.07403453
2	28	27.56267857	3.95883739	0.74814994

Variances	T	DF	Prob>|T|
Unequal	0.1453	22.1	0.8858
Equal	0.1417	38.0	0.8881

For H0: Variances are equal, F' = 1.13 DF = (27,11) Prob>F' = 0.8664

The SAS System 142
14:19 Wednesday, April 23, 1997

TTEST PROCEDURE

Variable: KI

VERSION	N	Mean	Std Dev	Std Error
1	12	19.98458333	3.80031545	1.09705657
2	28	18.26785714	4.78516640	0.90431145

Variances	T	DF	Prob>|T|
Unequal	1.2075	26.1	0.2381
Equal	1.1003	38.0	0.2781

For H0: Variances are equal, F' = 1.59 DF = (27,11) Prob>F' = 0.4262

Appendix G: Regression Analysis

SUMMARY OUTPUT for Information Product

Regression Statistics	
Multiple R	0,1609484
R Square	0,0259044
Adjusted R Square	0,002146
Standard Error	1,231341
Observations	43

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1,65315012	1,65315	1,090324	0,302517115
Residual	41	62,16422641	1,516201		
Total	42	63,81737653			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5,2174096	0,287713463	18,13405	3,43E-21
X Variable 1	0,1287847	0,123335041	1,044186	0,302517

SUMMARY OUTPUT for TMS staff and services

Regression Statistics	
Multiple R	0,3725075
R Square	0,1387618
Adjusted R Square	0,117756
Standard Error	0,7894659
Observations	43

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4,117157271	4,117157	6,60588	0,01389488
Residual	41	25,55351478	0,623256		
Total	42	29,67067205			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5,1351591	0,184465536	27,83804	3E-28
X Variable 1	0,2032389	0,079075426	2,570191	0,013895

SUMMARY OUTPUT for
Knowledge and involvement

Regression Statistics	
Multiple R	0,2956685
R Square	0,0874198
Adjusted R Square	0,0651618
Standard Error	1,1049144
Observations	43

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4,79490636	4,794906	3,92756	0,054231965
Residual	41	50,05426871	1,220836		
Total	42	54,84917507			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	4,3031317	0,258172796	16,66764	7,26E-20
X Variable 1	0,2193301	0,11067175	1,981807	0,054232

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13. ABSTRACT (*Maximum 200 Words*)

The purpose of this study was to evaluate the effectiveness of the Training Management System (' installed in the Security Assistance Organizations around the world. User satisfaction was measured as ar indicator of the system's effectiveness. In order to provide an objective measurement of the system effectiveness, the following research questions were addressed: (1) What is the system effectiveness rega the level of product quality provided by TMS ? (2) What is the level of involvement and knowledge of ' user related to the information services function? (3) What is the level of user perceived satisfaction w staff and services provided by support people of TMS ? (4) What is the perceived difference in levels of satisfaction between military and civilian for each of the questions 1, 2 and 3 above? (5) What is the im experience with the system on questions 1 to 3 above? User satisfaction was determined to be the best po measure of system effectiveness and it was measured by administering a user satisfaction survey. The da gathered from this survey was analyzed and that analysis provided the basis for concluding that TMS was meeting the users' needs, but that the system effectiveness could be improved by providing training. Recommendations were offered to the TMS staff support and suggestions for further research were also g

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